What is claimed is:

1. A semiconductor die, comprising:
an integrated circuit supported by a substrate;
a metal pattern line coupled to the integrated circuit;
a metal contact pad coupled to the metal pattern line; and
a solder ball contact coupled to the metal contact pad, wherein the solder ball contact is formed by a method comprising:
forming an insulating layer on the metal contact pad;
removing a portion of the insulating layer to expose a portion of the metal contact pad, thereby forming an exposed portion of the metal contact pad;
depositing solder on the exposed portion of the metal contact pad using selective deposition, thereby forming a solder contact; and
annealing the solder contact to form a solder ball contact.

2. The semiconductor die of claim 1, wherein the solder ball contact is formed by a method, the method further comprising depositing solder on the exposed portion of the metal contact pad using a deposition process selected from the group consisting of immersion contact, chemical vapor deposition and electrolytic deposition.

3. The semiconductor die of claim 1, wherein the solder comprises at least one material selected from the group consisting of lead, tin and bismuth.

4. A semiconductor die, comprising:
an integrated circuit supported by a substrate;
a metal pattern line coupled to the integrated circuit;

a metal contact pad coupled to the metal pattern line; and

a solder ball contact coupled to the metal contact pad, wherein the solder ball contact is formed by a method comprising:

forming an insulating layer on the metal contact pad;

removing a portion of the insulating layer to expose a portion of the metal contact pad, thereby forming an exposed portion of the metal contact pad;

immersing the substrate in molten solder;

depositing solder on the exposed portion of the metal contact pad, thereby forming a solder contact; and

annealing the solder contact to form a solder ball contact.

5. The semiconductor die of claim 4, wherein the molten solder comprises at least one material selected from the group consisting of lead, tin and bismuth.

6. A semiconductor die, comprising:

an integrated circuit supported by a substrate;

a metal pattern line coupled to the integrated circuit;

a metal contact pad coupled to the metal pattern line; and

a solder ball contact coupled to the metal contact pad, wherein the solder ball contact is formed by a method comprising:

forming an insulating layer on the metal contact pad;

removing a portion of the insulating layer to expose a portion of the metal contact pad, thereby forming an exposed portion of the metal contact pad;

adsorbing reactants on the exposed portion of the metal contact pad;

reacting the reactants on the exposed portion of the metal contact pad, thereby forming a solder contact; and

annealing the solder contact to form a solder ball contact.

7. A semiconductor die, comprising:

an integrated circuit supported by a substrate;

a metal pattern line coupled to the integrated circuit;

a metal contact pad coupled to the metal pattern line; and

a solder ball contact coupled to the metal contact pad, wherein the solder ball contact is formed by a method comprising:

forming an insulating layer on the metal contact pad;

forming a resist layer on the insulating layer;

patterning the resist layer to define a future exposed portion of the metal contact pad;

removing a portion of the insulating layer to expose a portion of the metal contact pad, thereby forming the exposed portion of the metal contact pad;

electrolytically depositing solder on the exposed portion of the metal contact pad, thereby forming a solder contact;

removing the resist layer, thereby exposing the solder contact above a surface of the insulating layer; and

annealing the solder contact to form a solder ball contact.

8. The semiconductor die of claim 7, wherein the solder comprises at least one material selected from the group consisting of lead, tin and bismuth.

9. A memory device, comprising:

an array of memory cells;

a metal pattern line coupled to the array of memory cells;

a metal contact pad coupled to the metal pattern line; and

a solder ball contact coupled to the metal contact pad, wherein the solder ball contact is formed by a method comprising:

forming an insulating layer on the metal contact pad;

removing a portion of the insulating layer to expose a portion of the metal contact pad, thereby forming an exposed portion of the metal contact pad;

depositing solder on the exposed portion of the metal contact pad using selective deposition, thereby forming a solder contact; and

annealing the solder contact to form a solder ball contact.

10. The memory device of claim 9, wherein the solder ball contact is formed by a method, the method further comprising depositing solder on the exposed portion of the metal contact pad using a deposition process selected from the group consisting of immersion contact, chemical vapor deposition and electrolytic deposition.

11. The memory device of claim 9, wherein the solder comprises at least one material selected from the group consisting of lead, tin and bismuth.

12. A memory device, comprising:

an array of memory cells;

a metal pattern line coupled to the array of memory cells;

a metal contact pad coupled to the metal pattern line; and

a solder ball contact coupled to the metal contact pad, wherein the solder ball contact is formed by a method comprising:

forming an insulating layer on the metal contact pad;

removing a portion of the insulating layer to expose a portion of the metal contact pad, thereby forming an exposed portion of the metal contact pad;

immersing the substrate in molten solder;

depositing solder on the exposed portion of the metal contact pad, thereby forming a solder contact; and

annealing the solder contact to form a solder ball contact.

13. The memory device of claim 12, wherein the molten solder comrpises at least one material selected from the group consisting of lead, tin and bismuth.

14. A memory device, comprising:

an array of memory cells;

a metal pattern line coupled to the array of memory cells;

a metal contact pad coupled to the metal pattern line; and

a solder ball contact coupled to the metal contact pad, wherein the solder ball contact is formed by a method comprising:

forming an insulating layer on the metal contact pad;

removing a portion of the insulating layer to expose a portion of the metal contact pad, thereby forming an exposed portion of the metal contact pad;

adsorbing reactants on the exposed portion of the metal contact pad;

reacting the reactants on the exposed portion of the metal contact pad, thereby forming a solder contact; and

annealing the solder contact to form a solder ball contact.

15. A memory device, comprising:

an array of memory cells;

a metal pattern line coupled to the array of memory cells;

a metal contact pad coupled to the metal pattern line; and

a solder ball contact coupled to the metal contact pad, wherein the solder ball contact is formed by a method comprising:

forming an insulating layer on the metal contact pad;

forming a resist layer on the insulating layer;

patterning the resist layer to define a future exposed portion of the metal contact pad;

removing a portion of the insulating layer to expose a portion of the metal contact pad, thereby forming the exposed portion of the metal contact pad;

electrolytically depositing solder on the exposed portion of the metal contact pad, thereby forming a solder contact;

removing the resist layer, thereby exposing the solder contact above a surface of the insulating layer; and

annealing the solder contact to form a solder ball contact.

16. The memory device of claim 15, wherein the solder comprises at least one material selected from the group consisting of lead, tin and bismuth.

17. A memory module, comprising:

a support;

a plurality of leads extending from the support;

a command link coupled to at least one of the plurality of leads;

a plurality of data links, wherein each data link is coupled to at least one of the plurality of leads; and

at least one memory device contained on the support and coupled to the command link, wherein the at least one memory device comprises:

an array of memory cells;

a metal pattern line coupled to the array of memory cells;

a metal contact pad coupled to the metal pattern line; and

a solder ball contact coupled to the metal contact pad,

wherein the solder ball contact is formed by a method comprising:

forming an insulating layer on the metal contact pad;

removing a portion of the insulating layer to expose a portion of the metal contact pad, thereby forming an exposed portion of the metal contact pad;

depositing solder on the exposed portion of the metal contact pad using selective deposition, thereby forming a solder contact; and

annealing the solder contact to form a solder ball contact.

18. The memory module of claim 17, wherein the solder ball contact is formed by a method, the method further comprising depositing solder on the exposed portion of the metal contact pad using a deposition process selected from the group consisting of immersion contact, chemical vapor deposition and electrolytic deposition.

19. The memory module of claim 17, wherein the solder comprises at least one material selected from the group consisting of lead, tin and bismuth.

20. A memory module, comprising:
a support;
a plurality of leads extending from the support;
a command link coupled to at least one of the plurality of leads;
a plurality of data links, wherein each data link is coupled to at least one of the plurality of leads; and
at least one memory device contained on the support and coupled to the command link, wherein the at least one memory device comprises:
an array of memory cells;
a metal pattern line coupled to the array of memory cells;
a metal contact pad coupled to the metal pattern line; and
a solder ball contact coupled to the metal contact pad,
wherein the solder ball contact is formed by a method comprising:
forming an insulating layer on the metal contact pad;
removing a portion of the insulating layer to expose a portion of the metal contact pad, thereby forming an exposed portion of the metal contact pad;

immersing the substrate in molten solder;

depositing solder on the exposed portion of the metal contact pad, thereby forming a solder contact; and

annealing the solder contact to form a solder ball contact.

21. The memory module of claim 20, wherein the molten solder comprises at least one material selected from the group consisting of lead, tin and bismuth.

22. A memory module, comprising:

a support;

a plurality of leads extending from the support;

a command link coupled to at least one of the plurality of leads;

a plurality of data links, wherein each data link is coupled to at least one of the plurality of leads; and

at least one memory device contained on the support and coupled to the command link, wherein the at least one memory device comprises:

an array of memory cells;

a metal pattern line coupled to the array of memory cells;

a metal contact pad coupled to the metal pattern line; and

a solder ball contact coupled to the metal contact pad,

wherein the solder ball contact is formed by a method comprising:

forming an insulating layer on the metal contact pad;

removing a portion of the insulating layer to expose a portion of the metal contact

pad, thereby forming an exposed portion of the metal contact pad;

adsorbing reactants on the exposed portion of the metal contact pad;

reacting the reactants on the exposed portion of the metal contact pad, thereby forming a solder contact; and

annealing the solder contact to form a solder ball contact.

23. A memory module, comprising:

a support;

a plurality of leads extending from the support;

a command link coupled to at least one of the plurality of leads;

a plurality of data links, wherein each data link is coupled to at least one of the plurality of leads; and

at least one memory device contained on the support and coupled to the command link, wherein the at least one memory device comprises:

an array of memory cells;

a metal pattern line coupled to the array of memory cells;

a metal contact pad coupled to the metal pattern line; and

a solder ball contact coupled to the metal contact pad, wherein the solder ball contact is formed by a method comprising:

forming an insulating layer on the metal contact pad;

forming a resist layer on the insulating layer;

patterning the resist layer to define a future exposed portion of the metal contact pad;

removing a portion of the insulating layer to expose a portion of the metal contact pad, thereby forming the exposed portion of the metal contact pad;

electrolytically depositing solder on the exposed portion of the metal contact pad, thereby forming a solder contact;

removing the resist layer, thereby exposing the solder contact above a surface of the insulating layer; and

annealing the solder contact to form a solder ball contact.

24. The memory module of claim 23, wherein the solder comprises at least one material selected from the group consisting of lead, tin and bismuth.

25. A memory system, comprising:

a controller;

a command link coupled to the controller;

a data link coupled to the controller; and

a memory device coupled to the command link and the data link, wherein the memory device comprises:

an array of memory cells;

a metal pattern line coupled to the array of memory cells;

a metal contact pad coupled to the metal pattern line; and

a solder ball contact coupled to the metal contact pad,

wherein the solder ball contact is formed by a method comprising:

forming an insulating layer on the metal contact pad;

removing a portion of the insulating layer to expose a portion of the metal contact pad, thereby forming an exposed portion of the metal contact pad;

depositing solder on the exposed portion of the metal contact pad using selective deposition, thereby forming a solder contact; and

annealing the solder contact to form a solder ball contact.

26. The memory system of 25, wherein the solder ball contact is formed by a method, the method further comprising depositing solder on the exposed portion of the metal contact pad using a deposition process selected from the group consisting of immersion contact, chemical vapor deposition and electrolytic deposition.

27. The memory system of 25, wherein the solder comprises at least one material selected from the group consisting of lead, tin and bismuth.

28. A memory system, comprising:

a controller;

a command link coupled to the controller;

a data link coupled to the controller; and

a memory device coupled to the command link and the data link, wherein the memory device comprises:

an array of memory cells;

a metal pattern line coupled to the array of memory cells;

a metal contact pad coupled to the metal pattern line; and

a solder ball contact coupled to the metal contact pad,

wherein the solder ball contact is formed by a method comprising:

forming an insulating layer on the metal contact pad;

removing a portion of the insulating layer to expose a portion of the metal contact pad, thereby forming an exposed portion of the metal contact pad;

immersing the substrate in molten solder;

depositing solder on the exposed portion of the metal contact pad, thereby forming a solder contact; and

annealing the solder contact to form a solder ball contact.

29. The memory system of claim 28, wherein the molten solder comprises at least one material selected from the group consisting of lead, tin and bismuth.

30. A memory system, comprising:

a controller;

a command link coupled to the controller;

a data link coupled to the controller; and

a memory device coupled to the command link and the data link, wherein the memory device comprises:

an array of memory cells;

a metal pattern line coupled to the array of memory cells;

a metal contact pad coupled to the metal pattern line; and

a solder ball contact coupled to the metal contact pad, wherein the solder ball contact is formed by a method comprising:

forming an insulating layer on the metal contact pad;

removing a portion of the insulating layer to expose a portion of the metal contact pad, thereby forming an exposed portion of the metal contact pad;

adsorbing reactants on the exposed portion of the metal contact pad;

reacting the reactants on the exposed portion of the metal contact pad, thereby forming a solder contact; and

annealing the solder contact to form a solder ball contact.

31. A memory system, comprising:

a controller;

a command link coupled to the controller;

a data link coupled to the controller; and

a memory device coupled to the command link and the data link, wherein the memory device comprises:

an array of memory cells;

a metal pattern line coupled to the array of memory cells;

a metal contact pad coupled to the metal pattern line; and

a solder ball contact coupled to the metal contact pad,

wherein the solder ball contact is formed by a method comprising:

forming an insulating layer on the metal contact pad;

forming a resist layer on the insulating layer;

patterning the resist layer to define a future exposed portion of the metal contact pad;

removing a portion of the insulating layer to expose a portion of the metal contact pad, thereby forming the exposed portion of the metal contact pad;

electrolytically depositing solder on the exposed portion of the metal contact pad, thereby forming a solder contact;

removing the resist layer, thereby exposing the solder contact above a surface of the insulating layer; and

annealing the solder contact to form a solder ball contact.

32. The memory system of claim 31, wherein the solder comprises at least one material selected from the group consisting of lead, tin and bismuth.

33. An electronic system, comprising:

a processor; and

a circuit module having a plurality of leads coupled to the processor, and

further having a semiconductor die coupled to the plurality of leads, wherein the semiconductor die comprises:

an integrated circuit supported by a substrate;

a metal pattern line coupled to the integrated circuit;

a metal contact pad coupled to the metal pattern line; and

a solder ball contact coupled to the metal contact pad,

wherein the solder ball contact is formed by a method comprising:

forming an insulating layer on the metal contact pad;

removing a portion of the insulating layer to expose a portion of the metal contact pad, thereby forming an exposed portion of the metal contact pad;

depositing solder on the exposed portion of the metal contact pad using selective deposition, thereby forming a solder contact; and

annealing the solder contact to form a solder ball contact.

34. The electronic system of claim 33, wherein the solder ball contact is formed by a method, the method further comprising depositing solder on the exposed portion of the metal contact pad using a deposition process selected from the group consisting of immersion contact, chemical vapor deposition and electrolytic deposition.

35. The electronic system of claim 33, wherein the solder comprises at least one material selected from the group consisting of lead, tin and bismuth.

36. An electronic system, comprising:

a processor; and

a circuit module having a plurality of leads coupled to the processor, and further having a semiconductor die coupled to the plurality of leads, wherein the semiconductor die comprises:

an integrated circuit supported by a substrate;

a metal pattern line coupled to the integrated circuit;

a metal contact pad coupled to the metal pattern line; and

a solder ball contact coupled to the metal contact pad,

wherein the solder ball contact is formed by a method comprising:

forming an insulating layer on the metal contact pad;

removing a portion of the insulating layer to expose a portion of the metal contact pad, thereby forming an exposed portion of the metal contact pad;

immersing the substrate in molten solder;

depositing solder on the exposed portion of the metal contact pad, thereby forming a solder contact; and

annealing the solder contact to form a solder ball contact.

37. The electronic system of claim 36, wherein the molten solder comprises at least one material selected from the group consisting of lead, tin and bismuth.

38. An electronic system, comprising:

a processor; and

a circuit module having a plurality of leads coupled to the processor, and further having a semiconductor die coupled to the plurality of leads, wherein the semiconductor die comprises:

an integrated circuit supported by a substrate;

a metal pattern line coupled to the integrated circuit;

a metal contact pad coupled to the metal pattern line; and

a solder ball contact coupled to the metal contact pad, wherein the solder ball contact is formed by a method comprising:

forming an insulating layer on the metal contact pad;

removing a portion of the insulating layer to expose a portion of the metal contact pad, thereby forming an exposed portion of the metal contact pad;

adsorbing reactants on the exposed portion of the metal contact pad;

reacting the reactants on the exposed portion of the metal contact pad, thereby forming a solder contact; and

annealing the solder contact to form a solder ball contact.

39. An electronic system, comprising:

a processor; and

a circuit module having a plurality of leads coupled to the processor, and further having a semiconductor die coupled to the plurality of leads, wherein the semiconductor die comprises:

an integrated circuit supported by a substrate;

a metal pattern line coupled to the integrated circuit;

a metal contact pad coupled to the metal pattern line; and

a solder ball contact coupled to the metal contact pad, wherein the solder ball contact is formed by a method comprising:

forming an insulating layer on the metal contact pad;

forming a resist layer on the insulating layer;

patterning the resist layer to define a future exposed portion of the metal contact pad;

removing a portion of the insulating layer to expose a portion of the metal contact pad, thereby forming the exposed portion of the metal contact pad;

electrolytically depositing solder on the exposed portion of the metal contact pad, thereby forming a solder contact;

removing the resist layer, thereby exposing the solder contact above a surface of the insulating layer; and

annealing the solder contact to form a solder ball contact.

40. The electronic system of claim 39, wherein the solder comprises at least one material selected from the group consisting of lead, tin and bismuth.